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ABSTRACT

A review of research indicates that cognitive restraint is insufficient in accounting for the relationship between restraint and negative affect eating. To explore what mechanism may be responsible for restraint effects, college students in two samples (Total N=378) completed the Three-Factor Eating Questionnaire (TEQ), a restraint scale consisting of three factors: cognitive restraint, disinhibition, and hunger sensitivity. Data analysis revealed a small inverse correlation between cognitive restraint and hunger sensitivity. Hunger sensitivity was strongly correlated with disinhibition, while there was no correlation between cognitive restraint and disinhibition. In a second study, normal weight female college students completed the TEQ. Afterwards, subjects' moods were manipulated using the Velten Mood Induction Procedure and subjects were given candies to eat while completing the Velten procedure. Although interim data on 47 subjects from this 2 (hunger sensitivity level) by 2 (neutral or depressed mood) factorial study appeared to show an interaction, with depressed high hunger sensitivity subjects eating approximately three times as much as other subjects, the level of variability in eating was very high and the interaction was not statistically significant. The results did suggest that hunger sensitivity may be a predictor of negative affect eating. (NRB)

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Restraint Theory: The Search for a Mechanism

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Restraint Theory: The Search for a Mechanism

The theory of restrained eating was originally proposed as an alternative to externality theory for explaining differences in the eating responses of normal and overweight individuals. The theory suggests that differences in the behavior of normal and overweight persons are due to the tendency of obese individuals to diet. Thus the anomalous behaviors associated with obesity, in this view, are consequences of obese persons' dietary restriction rather than causes of their overweight conditon. Herman, Polivy and their colleagues have supported this contention by showing that normal weight restrained eaters resemble obese persons on dimensions such as emotionality, distractibility and counterregulatory eating (Herman & Polivy, 1980a).

The purpose of the present paper is to explore what mechanism may be responsible for restraint effects. Though I will first investigate this issue without regard to any particular dependent variable, my ultimate aim is to better understand the mechanism responsible for the relationship between restraint and negative affect eating.

While restraint has been a robust predictor of behaviors once associated solely with obesity, the mechanism responsible for these effects is unclear. Herman and Polivy (1980a) explain the effects of restraint cognitively. Restrained eaters are thought to invest great energy in fighting urges to eat and in achieving a slim figure. If these goals are threatened - for instance, by a stressor or the consumption of high calorie foods - restrained eaters temporarily abandon their dietary concerns. They essentially say to themselves:

"What the heck, I've blown my diet - why hold back now?" and proceed to overeat.

The evidence supporting a cognitive explanation of restraint effects is mixed, however. Drewnowski, Riskey and Desor (1982) examined the relationship between the Dietaary Concern factor of the Restraint Scale and percentage overweight. While restraint theory would predict that overweight subjects should score higher than normals on Dietary Concern, there in fact was no difference found between the two groups. In a recent study, we found that the Dietary Concern factor did correlate significantly with percent overweight, though the correlation was only .35 (Lowe, 1984). Though these two studies present conflicting data, it does appear that the degree of relationship between dietary concern and overweight is not as great as restraint theory suggests.

A second source of the uncertainty concerning the role of dietary concern in restraint comes from two experimental studies. The first, by Frost, Goolkasian, Ely & Blanchard (1982) examined the eating responses of restrained and unrestrained normal weight subjects induced into either depressed or nondepressed moods. Consistent with restraint theory, Frost et al. found that depressed, restrained eaters ate the most food. However, they then reanalyzed their results by reassigning subjects to restraint conditions based on either their Dietary Concern or Weight Fluctuation scores from the Restraint Scale. The original results no longer held up when subject classification was based on the Dietary Concern factor, but they were strengthened when it was based on the Weight Fluctuation factor. Ruderman (in press), on the other hand, recently found exactly the opposite. Using a different mood induction

procedure and eating test, she found that Dietary Concern predicted affect-induced eating while Weight Fluctuation did not.

To sum up these studies, it appears that dietary concern is a relatively weak & inconsistent predictor of restrained eating phenomena. An explanation for why this is so may be found by examining the derivation of restraint theory itself. Restraint theory is based on Nisbett's theory of body weight set-point (1972). Nisbett suggested that we all have a biologically-based set-point for weight much like the homeostatic mechanism responsible for maintaining a stable body temperature. Reduction of one's weight below this set-point presumably evokes physiological responses that increase the probability of eating. Herman and Polivy argued that, in the absence of a direct measure of set-point and deviations from it, the degree of cognitive restraint an individual utilized to avoid eating would be a reflection of his/her deviation from set-point. Cognitive restraint was assessed using the Restraint Scale, which tapped respondents' cognitive and emotional investment in the regulation of eating and weight. Yet Herman and Polivy's notion that cognitive restraint is isomorphic with, or even highly correlated with, suppression of weight below set-point may be mistaken for two reasons. First, in western society, where such extreme emphasis is placed on a slender appearance, there are likely to be many individuals who are concerned with their diet but who nonetheless do not weigh much less than they have always weighed as adults. Such people, who are not really suppressing their weight but would like to, would score high on a measure of dietary restraint. However, since they are not suppressing their weight, they would not, according to set-point theory, behave like restrained eaters.

A second group of individuals who appear to contradict the putative overlap between cognitive restraint and deviation from set-point are those individuals who have maintained a substantial weight loss but who are no longer unduly concerned with dieting. Restraint theory suggests that people who lose weight and maintain the loss should score higher in cognitive restraint than those who lose a comparable amount of weight but then regain it. However, a study by Harowski and Jeffrey (1982) indicated just the opposite: In this study, weight loss maintainers scored significantly lower in restraint than weight regainers, and this finding was based on the first version of the Restraint Scale (Herman & Mack, 1975) which emphasized cognitive aspects of restraint even more than later versions.

In sum, while cognitive restraint may partially account for some of the behavioral characteristics that have been associated with restraint, there does not appear to be adequate support for viewing it as the sole mechanism, or even the primary mechanism, responsible for restraint effects. Where else might we turn to better understand the bases of the undeniably robust effects of restraint? Following Nisbett's original lead, it is possible that degree of current weight suppression might reflect deviation from set-point and therefore be predictive of restraint phenomena. Consistent with this speculation, we recently found that normal weight restrained eaters, as definned by Herman and Polivy, were suppressing their weight four times as much as normal weight unrestrained eaters were (Lowe, 1984). We are currently planning to investigate this suggestion further. A related variable of potential interest is weight fluctuation, which has been predictive of restraint phenomena inn two studies (Drewnowski, et al.,

1982; Frost, et al., 1982). However, while weight fluctuation may be a worthwhile predictor, it is of little value in explaining the effects of restraint.

A new clue into the workings of restraint, at least in relation to negative affect eating, was introduced with the development of a new restraint scale by Stunkard and Messick (1984). This questionnaire represented a considerable expansion and modification of Herman & Polivy's Restraint Scale. Stunkard and Messick's scale consists of three factors and is referred to as the Three-Factor Eating Questionnaire (or TEQ). The first factor, called Dietary Restraint, is an elaborated version of Herman and Polivy's Dietary Concern factor. I will refer to Dietary Restraint as Cognitive Restraint here since most of the items refer to the intention of exercising restraint, not the accomplished fact. And, as many of us know, intentions to diet do not always translate into actual dieting. The second factor, called Disinhibition, refers to the tendency to overeat when distressed or in the presence of appealing foods. The disinhibition factor describes a pattern of overeating but, like weight fluctuation, tells us little about the process responsible for such overeating. Thus there will be little discussion of the disinhibition factor in the remainder of this paper. The third factor, which Stunkard & Messick called Hunger, reflects the tendency to notice hunger sensations and to respond to them by eating. Because this factor describes susceptibility to hunger, I will refer to it as Hunger Sensitivity.

There are two studies which suggest that the Hunger Sennsitivity factor predicts negative affect eating. The first, conducted by Marcus and Wing (1983), found a correlation of .54 ($p < .001$) between the

hunger sensitivity factor and severity of binge eating among obese women. The second, by Weissenburger, Rush, Giles, Kumetz and Stunkard (1984), found a small but significant correlation between Hunger Sensitivity and the amount of weight change experienced by clinically depressed psychiatric patients ($r=.30$, $p < .05$). Interestingly, the Cognitive Restraint factor did not correlate with either binge eating in Marcus and Wing's study nor with weight change in Weissenburger et al's study.

Before discussing hunger sensitivity any further, it is important to point out that hunger sensitivity, though included as a factor in the TEQ, should probably not be viewed as a component of restraint. The evidence for this stems from comparisons which Stunkard and Messick made between the factor scores of the restrained and unrestrained eaters upon whom the questionnaire was derived. For the Cognitive Restraint and Disinhibition factors, restrained eaters scored much higher than unrestrained eaters. However, there was no difference between these two groups on the Hunger Sensitivity factor. This suggests that whatever the reason for the Hunger Sensitvity factor's relationship with negative affect eating, this relationship is not directly dependent upon restraint status.

What then might explain the apparent association between hunger sensitivity and negative affect eating? There are at least two possibilities. First, it is possible that hunger sensitivity combines interactively with restraint. Being food deprived is generally aversive and is probably especially aversive for individuals who are highly sensitive to sensations of hunger. If a hunger sensitive individual who is restricting food intake also becomes upset, the

discomfort associated with hunger will combine with that from the upset to create considerable negative affect. Any self-control efforts directed toward restricting food intake may be temporarily abandoned and subsequent food intake might be powerfully reinforced via a reduction in negative affect.

A second possible reason for the association between hunger sensitivity and emotional eating is more speculative, but intriguing nonetheless. This possibility was suggested by a recent study by Spitzer and Rodin (1983). These authors were interested in the relationship between arousability and hunger conditioning. Spitzer and Rodin (1983) examined this relationship by measuring arousability (on both physiological and paper-and-pencil measures) and the extent to which subjects would acquire hunger responses after repeatedly tasting a novel food (mango sherbert). These investigators found a strong correlation ($r = .76$, $p < .005$) between arousability and hunger conditioning - that is, the most arousable subjects became the hungriest when presented with the novel food a day after the conditioning trials. If we assume that subjects who conditioned strongly to the novel food develop strong hunger responses to food generally, then such individuals might be considered hunger sensitive in Stunkard and Messick's sense of the term. As such they may be more arousable and therefore more likely to develop conditioned associations between arousal and eating. As others have pointed out e.g., Herman and Polivy, 1980b) such a process could constitute the basis for the frequently-made clinical observation that many eating disordered individuals confuse feelings of distress and of hunger. Though speculative at present, such a possibility deserves empirical testing.

Two Studies on Cognitive Restraint and Hunger Sensitivity

We conducted two studies to explore the role of cognitive restraint and hunger sensitivity in negative affect eating. The first study examined the factor structure of Stunkard and Messick's restraint questionnaire in a college student population. The second involved an experimental evaluation of cognitive restraint and hunger sensitivity in the prediction of negative affect eating.

Study I

Since our ultimate goal was to examine the predictive power of the TEQ factors in a college population, we first factor analyzed the questionnaire using the responses of 193 students of both sexes. Reexamining the TEQ's factor structure among college students was considered necessary because the derivation sample for the questionnaire consisted mostly of community residents chosen because they represented extremes on the spectrum of restraint (Stunkard & Messick, 1984).

Using the same factoring and rotation methods as Stunkard and Messick, we found three interpretable factors which corresponded fairly well to those originally found by Stunkard and Messick. The item compositions of the two factors of greatest relevance here - what I have referred to as Cognitive Restraint and Hunger Sensitivity - are shown in Table 1.

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Place Table 1 about here

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It appears that the three-factor solution originally proposed by Stunkard and Messick is a robust one since it was largely replicated in

our subject sample, which differed on several dimensions from the original.

Of particular interest to the present discussion is the intercorrelation of these three factors. Stunkard and Messick reported on these correlations in their derivation sample but these correlations are difficult to interpret because they are affected by the orthogonality procedure used to derive the factors themselves. We therefore gave the TEQ to a second sample of 185 college students. We calculated factor scores for this new sample using the factor loadings from our first sample. The correlations between the three factors in our second sample are shown in Table 2. The small inverse

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correlation between Cognitive Restraint and Hunger Sensitivity suggests, in line with restraint theory, that cognitively restrained eaters are somewhat successful at "denying" their hunger. However, the lack of correlation between Cognitive Restraint and Disinhibition is consistent with the studies reviewed earlier which suggested that cognitive restraint is not the potent source of disinhibition it is thought to be in restraint theory. Also consistent with the previously cited studies, Hunger Sensitivity was rather strongly correlated with Disinhibition.

While suggestive, all of the data on the relationship between hunger sensitivity and negative affect eating has been correlational in nature. Therefore, the purpose of the second study we conducted was to experimentally evaluate the relationship between hunger sensitivity and

emotional eating.

Study II

Subjects for this experiment were normal weight, female college students. Subjects completed the TFQ during class time and were called a few weeks later to participate in a study on "moods and personality." Subjects were assigned to high or low Hunger Sensitivity groups based on a median split of their Hunger Sensitivity factor scores. Subjects in both groups were then randomly assigned to a neutral or a depressed mood condition; mood was manipulated using the Velten Mood Induction Procedure (Velten, 1968). At the end of the mood induction instructions, subjects were casually invited to munch on some M & M candies while they completed the Velten procedure. (The overall procedure followed was very similar to that used by Frost et al. (1982) in a study referred to earlier.) The design of the study, then, was a 2 (Hunger Sensitivity level) x 2 (neutral vs. depressed mood) factorial, with grams of candy eaten as the dependent measure.

This study is now 80% complete; another 13 subjects must still be run. However, we do have data on 47 subjects and therefore interim results will be presented here.

A check on the mood manipulation indicated that it was successful; subjects in the negative mood condition became substantially more depressed than subjects in the neutral condition. Interim results for average amount of candy consumed by the four groups in this study are shown in Figure 1.

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Place Figure 1 about here

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The results depicted in the upper graph of figure 1 appear to show an interaction with depressed, high hunger sensitivity subjects eating approximately three times as much as subjects in the other three groups. However, the level of variability in eating was very high and the interaction was not statistically significant ($F(1,43) = 2.06$, $p=.16$). It remains to be seen whether this apparent interaction will be statistically reliable when the remaining subjects have been run.

For comparison purposes we decided to also examine cognitive restraint as a predictor of negative affect eating among these same subjects. This was done be calculating subjects' Cognitive Restraint factor scores and reassigning subjects to high or low cognitive restraint conditions using a median split. The consumption data based on this reanalysis is illustrated in the lower graph of figure 2. It can be seen that while depressed subjects ate somewhat more than nondepressed subjects ($F(1,45) = 3.06$, $p < .09$), there was no hint of an interaction between cognitive restraint and mood ($F(1,43) < 1$, ns).*

Conclusions

The preponderance of evidence reviewd in this paper indicates that cognitive restraint is an insufficient means by which to account for the relationships between restraint and negative affect eating. Whether this conclusion holds for other behavioral responses examined in the restraint literature (e.g., distractability, response to high calorie preloads) remains to be determined.

Set-point theory, from which restraint theory was derived, was originally framed in terms of deviations from a biologically appropriate weight. It is possible that such deviations account for restraint phenomena better than the cognitive restraint which is

*Details of the completed study will be available in late 1984.

thought to result from these deviations. This possibility requires addtional study.

While weight fluctuation and disinhibition are two variables which distinguish between restrained and unrestrainted eaters, they are merely descriptive terms and are of little value in explaining the effects of restraint.

Hunger sensitivity, on the other hand, though not distinguishing between restrained and unrestrained eaters, is a promising predictor of negative affect eating. The reason for this relationship is unclear, but may involve an association between hunger sensitivity and arousability - a final issue which deserves further study.

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Table 1 Item Composition of Cognitive Restraint and Hunger Sensitivity Factors

Cognitive Restraint	Hunger Sensitivity
When I have eaten my quota of calories, I am usually good about not eating any more.	I am usually so hungry that I eat more than three times a day.
I deliberately take small helpings as a means of controlling my weight.	Dieting is hard for me because I just get too hungry.
Life is too short to worry about dieting. (-)	Since I am often hungry, I sometimes wish that while I am eating an expert would tell me that I have had enough or that I can have something more to eat.
Since my weight goes up and down, I have gone on reducing diets more than once.	I often feel so hungry that I just have to eat something.
I have a pretty good idea of the number of calories in common foods.	I get so hungry that my stomach often seems like a bottomless pit.
While on a diet, if I eat a food that is not allowed I consciously eat less for a period of time to make up for it.	I sometimes get very hungry in the evening or at night.
I enjoy eating too much to spoil it by counting calories or watching my weight. (-)	How often do you feel hungry?
I often stop eating when I am full as a conscious means of limiting the amount that I eat.	How difficult would it be for you to stop eating halfway through dinner and not eat for the next four hours?
I consciously hold back at meals in order not to gain weight.	Do you eat sensibly in front of others and splurge alone?
I eat anything I want, any time I want. (-)	Do you go on eating binges even though you are not hungry?
I count calories as a conscious means of controlling my weight.	
I do not eat some foods because they make me fat.	
I pay a great deal of attention to changes in my figure.	
How often are you dieting in a conscious effort to control your weight?	
Would a weight fluctuation of 5 lbs affect the way you live your life?	
Do feelings of guilt about over-eating help you to control your food intake?	
How conscious are you of what you are eating?	
How frequently do you avoid "stocking up " on tempting foods?	
How likely are you to shop for low calorie foods?	
How likely are you to consciously eat slowly in order to cut down on how much you eat?	
How likely are to consciously eat less than you want?	
On a scale of 1 to 9, where 1 means no restraint in eating (eat whatever you want, whenever you want it) and 9 means total restraint (constantly limiting food intake and never "giving in"), what number would you give yourself?	

Table 2 Intercorrelation of factors from the Three-Factor Eating Questionnaire

Cognitive Restraint/Hunger Sensitivity	-.25 ($p < .001$)
Cognitive Restraint/Disinhibition	.13 ($p < .10$)
Hunger Sensitivity/Disinhibition	.57 ($p < .001$)

Note: N = 183

Figure 1 The effect of mood on eating for subjects classified by hunger sensitivity (upper graph) and cognitive restraint (lower graph)